

Name: \_\_\_\_\_

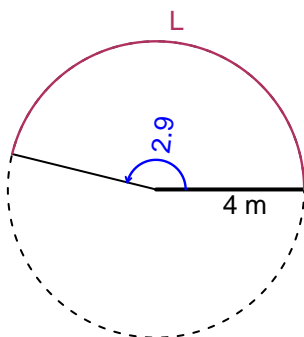
Date: \_\_\_\_\_

## Trig Final (SLTN v676)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

### Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2.9 radians. The radius is 4 meters. How long is the arc in meters?

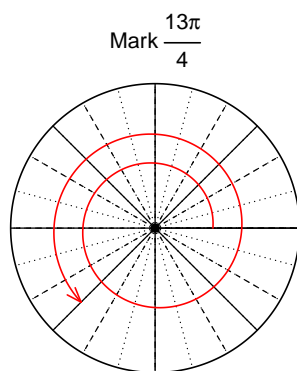


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$L = 11.6$  meters.

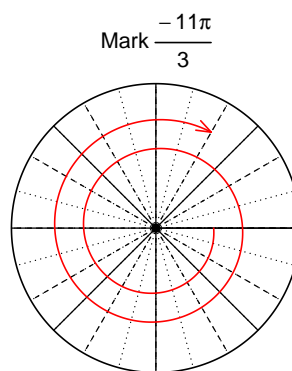
### Question 2

Consider angles  $\frac{13\pi}{4}$  and  $-\frac{11\pi}{3}$ . For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for  $\cos\left(\frac{13\pi}{4}\right)$  and  $\sin\left(-\frac{11\pi}{3}\right)$  by using a unit circle (provided separately).



Find  $\cos(13\pi/4)$

$$\cos(13\pi/4) = \frac{-\sqrt{2}}{2}$$



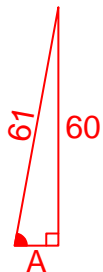
Find  $\sin(-11\pi/3)$

$$\sin(-11\pi/3) = \frac{\sqrt{3}}{2}$$

### Question 3

If  $\sin(\theta) = \frac{-60}{61}$ , and  $\theta$  is in quadrant III, determine an exact value for  $\tan(\theta)$ .

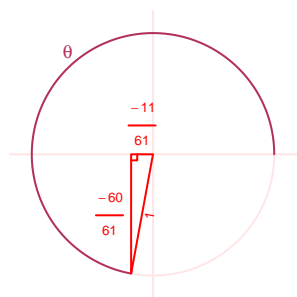
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}A^2 + 60^2 &= 61^2 \\A &= \sqrt{61^2 - 60^2} \\A &= 11\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-60}{61}}{\frac{-11}{61}} = \frac{60}{11}$$

### Question 4

A mass-spring system oscillates vertically with a midline at  $y = -7.99$  meters, a frequency of 6.22 Hz, and an amplitude of 4.61 meters. At  $t = 0$ , the mass is at the maximum height. Write an equation to model the height ( $y$  in meters) as a function of time ( $t$  in seconds).

Any of these equations would get full credit.

$$y = 4.61 \cos(2\pi 6.22t) - 7.99$$

or

$$y = 4.61 \cos(12.44\pi t) - 7.99$$

or

$$y = 4.61 \cos(39.08t) - 7.99$$